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HRE-0583

OPERATION TEAPOT 1955

United States Atmospheric Nuclear Weapons Tests
Nuclear Test Personnel Review

Prepared by the Defense Nuclear Agency as Executive Agency
for the Department of Defense

- Use of protective equipment - providing anticontamination equipment, including clothing and respirators
- Monitoring - performing radiological surveys and controlling access to all contaminated areas
- Briefing - informing observers and project personnel of radiological hazards and the current status of contamination in the test area
- Decontamination - detecting, removing, and disposing of contaminated material from personnel and equipment.

Summaries of TEAPOT Events

The 15 TEAPOT events are summarized in the accompanying table and the ground zeros are shown in the accompanying map. Eight shots--WASP, TESLA, TURK, BEE, ESS, APPLE 1, MET, and APPLE 2--each included more than 500 DOD participants and are described below.

Shot WASP, an airdropped nuclear device, was detonated at an altitude of 762 feet above Area 7 of Yucca Flat. It had a yield of one kiloton and occurred at 1200 hours on 18 February 1955. Onsite residual radiation greater than 0.01 R/h was confined to a circular area extending about two kilometers from ground zero. As part of Exercise Desert Rock VI, the armed services conducted troop observer and technical service programs involving more than 900 exercise troops, primarily as observers. Troops were scheduled to view the detonation from trenches 4,500 meters south of ground zero, but these trenches were in the predicted path of fallout. Observers therefore viewed the detonation from News Nob, approximately 14 kilometers south of ground zero. Since the equipment display area was also in the path predicted for the fallout, the postshot tour of the display area was canceled.

Shot TESLA, a 300-foot tower detonation, was fired at 0530 hours on 1 March 1955 in Area 9. Although the predicted yield was two kilotons, the nuclear device detonated with a yield of seven kilotons. As at Shot WASP, the armed services conducted troop observer, troop test, and technical service programs as part of Exercise Desert Rock VI. These programs involved almost 600 troops, primarily Camp Desert Rock support troops, observing the shot. The closest troops witnessed the detonation from trenches 2,220 meters southwest of ground zero. Because of high radiation levels, the troops could inspect the display area only up to 900 meters from ground zero. Fallout intensities of up to 10 R/h were detected during the initial survey about 800 meters southwest and south of ground zero.

Shot TURK, a 500-foot tower detonation, was fired with a yield of 43 kilotons at 0520 hours on 7 March 1955 in Area 2. Fallout of up to 10 R/h was detected about 2,100 meters southeast of ground zero

during the initial survey, which was conducted from 0630 to 0915 hours. Exercise Desert Rock included observer, troop test, and technical service programs. Most of the 500 Desert Rock troops were support troops observing the shot. Trenches were constructed for TURK troop observers 3,200 meters south of ground zero, but because these trenches were in the expected fallout path, they were not used. Instead, troops occupied the TESLA trenches, located about 5,000 meters southeast of the TURK ground zero. The postshot tour of the display area was postponed until the day after the shot, due to radiation levels in the display area on shot-day.

Shot BEE, a 500-foot tower detonation, was fired with a yield of eight kilotons at 0505 hours on 22 March 1955 in Area 7 of Yucca Flat. Fallout of 10 R/h was detected around ground zero during the initial survey. Fallout between 0.01 R/h and 0.1 R/h extended east of ground zero. At BEE, almost 3,000 personnel performed Exercise Desert Rock troop observer, troop test, and technical service programs. At Shot BEE, about 299 officers and 1,972 enlisted men of the Third Marine Corps Provisional Atomic Exercise Brigade participated in the largest single activity of the TEAPOT Series, the Marine Brigade Exercise. The Marine Brigade was comprised of units from the 1st Marine Division and the 3d Marine Air Wing. Air operations units for the exercise included Marine Helicopter Transport Group 36, Marine Air Support Squadron 363. The Marine Brigade Exercise provided the opportunity for training personnel and for testing the tactics and techniques employed if a nuclear detonation were used in support of an air-ground task force. After the participants observed the shot, some from trenches 3,200 meters southwest of ground zero, they conducted a maneuver, which consisted of an airlift and an assault on the objectives. They then toured the equipment display area. A total of 30 H-19 helicopters took part in the airlift, which began about five minutes after the detonation and was completed almost four hours later. After disembarking from the helicopters, the Marines seized objectives about 15 kilometers west of ground zero. This part of the maneuver ended at 1500 hours, at which time the Marines toured the display area, located from 460 to 2,560 meters southwest of ground zero. Observers had toured this area earlier. At 1730 hours, when the maneuver was completed, the Marines checked in at the decontamination station at Yucca Pass.

Shot ESS, the only subsurface detonation of the TEAPOT Series, was fired with a yield of one kiloton at 1230 hours on 23 March 1955 in Area 10 of Yucca Flat. The ESS event was an operational test of an atomic demolition munition. Fallout greater than 0.01 R/h occurred mainly southeast of ground zero, but extended up to 2,500 meters southwest of ground zero. Because the nuclear device was buried 67 feet underground, tons of earth were blown upward by the detonation, creating a crater 88 meters wide and 96 feet deep. Exercise Desert Rock troop observer, troop test, and technical

service programs engaged almost 800 troops during Shot ESS. Approximately 350 of these troops were observers. The closest troops witnessed the detonation in the open 8,230 meters southwest of ground zero. One of the other Exercise Desert Rock projects, Project 40.16, was designed to place and test the ESS demolition munition. Personnel of the 271st Engineer Combat Battalion excavated the shaft and placed the ESS device. Project 40.9, Passive Defense Training, was conducted to train Navy civilian shipyard and laboratory personnel in establishing safe working conditions close to a nuclear detonation. A total of 168 individuals from Navy units all over the country participated in pre- and postshot training, including monitoring techniques and practice rescue operations. Two other projects, Location of Atomic Bursts and Ordnance Vehicular Equipment Test, occupied the remainder of the Exercise Desert Rock participants at Shot ESS.

Shot APPLE 1, a 500-foot tower detonation, was fired with a yield of 14 kilotons at 0455 hours on 29 March 1955 in Area 4. Onsite fallout of up to 10 R/h was detected during the initial survey. Exercise Desert Rock VI troop observer, troop test, and technical service projects engaged more than 600 troops at APPLE 1, primarily Camp Desert Rock support troops observing the shot. Troops witnessed the detonation from trenches 3,200 meters south-southwest of ground zero. After the detonation, they toured the equipment display area, 900 to 2,250 meters southwest of ground zero. In another Exercise Desert Rock project, Sixth Army Passive Defense Training, about 24 persons conducted surveys of the ground zero area on the day after the shot, establishing the 1 and 5 R/h lines to within 100 meters of ground zero.

Shot MET, a 500-foot tower detonation, was fired with a yield of 22 kilotons at 1115 hours on 15 April 1955 in Frenchman Flat. Fallout of up to 10 R/h was detected around ground zero, extending no farther than 1,500 meters southwest of ground zero. Shot MET, an acronym for Military Effects Test, involved the largest number of scientific experiments of any shot in the TEAPOT Series. A total of 38 experiments were conducted by DOD personnel of the Military Effects Group. Because of the extensive preparation required for these experiments beforehand, MET was detonated in Frenchman Flat, away from other shots in the TEAPOT Series, to allow project participants to work throughout the Series unhampered by radioactivity from other shots. Desert Rock programs engaged approximately 260 troops, primarily Camp Desert Rock support troops observing the shot. The troops witnessed the detonation from ten kilometers southwest of ground zero.

Shot APPLE 2, a 500-foot tower detonation, was fired with a yield of 29 kilotons at 0510 hours on 5 May 1955 in Area 1 of Yucca Flat. Onsite fallout occurred northwest of ground zero. Readings of 10 R/h were detected northwest of ground zero almost two hours after the detonation. In addition to troop observer, troop test, and technical service programs conducted as part of Exercise Desert Rock VI, which involved about 800 troops, one special troop test involved

about 1,000 troops at Shot APPLE 2. The test of an Armored Task Force, RAZOR, was designed to demonstrate the capability of a reinforced tank battalion to seize an objective immediately after a nuclear detonation. This project was sponsored by the Army Armored School of Fort Knox, Kentucky. Task Force RAZOR was composed of the following armored units:

Camp Irwin, California

- 723rd Tank Battalion

Fort Hood, Texas

- Company C, 510th Armored Infantry Battalion, 4th Armored Division
- Company B, 510th Armored Infantry Battalion, 4th Armored Division
- 1st Platoon, Battery A, 22nd Armored Field Artillery Battalion, 4th Armored Division
- 1st Platoon, Company C, 24th Armored Engineer Battalion, 4th Armored Division
- Provisional Aviation Company, 1st Armored Division.

The armored test involved the following activities:

- A tactical march across open desert terrain from Camp Irwin to the NTS
- Participation in the APPLE 2 event and the armored task force maneuver
- An overland march back to Camp Irwin
- A chemical warfare exercise at Camp Irwin.

Vehicles employed in the maneuver included 55 M48 tanks, two M41 tanks, five M74 tank recovery vehicles, one M75 armored personnel carrier, 25 M59 armored personnel carriers, four M7B2 self-propelled 105 mm howitzers, and about 150 wheeled vehicles.

The four-day overland march from Camp Irwin began 18 April 1955 and ended 21 April 1955. From 21 April to 4 May, the task force rehearsed the maneuver in the forward area of the NTS. Three times during this period, the task force camped in Yucca Flat in preparation for the shot, but in each instance, the shot was postponed due to poor weather. On 4 May 1955, the day before detonation, the task force vehicles were positioned northbound, from three to five kilometers south of ground zero. At the time of the shot, all tank turrets were rotated to the rear, all sight apertures were sealed with opaque tape, and all hatches were

closed and secured. All personnel took protective measures appropriate to their distance from the shot. The detonation caused no significant damage to the task force, although most of the engine and fan access panels were dislodged from the M59 personnel carriers. They were repositioned for the maneuver, which began upon clearance by the Test Director.

About eight minutes after the shot, all units were mobilized and moving toward ground zero, maintaining radio contact with the Task Force Commander. About 20 monitors from the 50th Chemical Service Platoon were provided to check radiation levels during the assault. When the tanks closest to ground zero obtained an inside reading of 1 R/h, about 890 meters from ground zero, the Task Force Commander ordered the formation to execute a partial left turn away from ground zero. Two M59s in the rear of the formation temporarily lost contact and moved to within 820 meters of ground zero before they recovered and joined the rest of the task force a few minutes later. After passing through a defile at Syncline Ridge, the task force attained its objective, about 6.4 kilometers from the preshot position, about 90 minutes after detonation. To bring realism to the maneuver, tank guns and coaxial machine-guns fired blanks in the final stages of the assault. After the maneuver, task force members were brushed with brooms to remove dust and debris, even though monitoring of both personnel and vehicles showed no significant contamination.

Radiation Exposures at TEAPOT

As of November 1981, the military services had identified 7,930 participants by name for Operation TEAPOT. Film badge data are available for 4,504 of these participants, as shown in the "Summary of Dosimetry for Operation TEAPOT" table. It is estimated that the total number of participants in Operation TEAPOT was approximately 11,000 personnel. Using this estimate, 72 percent have been identified by name and film badge data has been located for 41 percent. The table also includes information, listed by service or affiliation, on the number of personnel in various dose ranges, the number of personnel with zero gamma exposure, the average gamma exposure and the maximum gamma exposure.

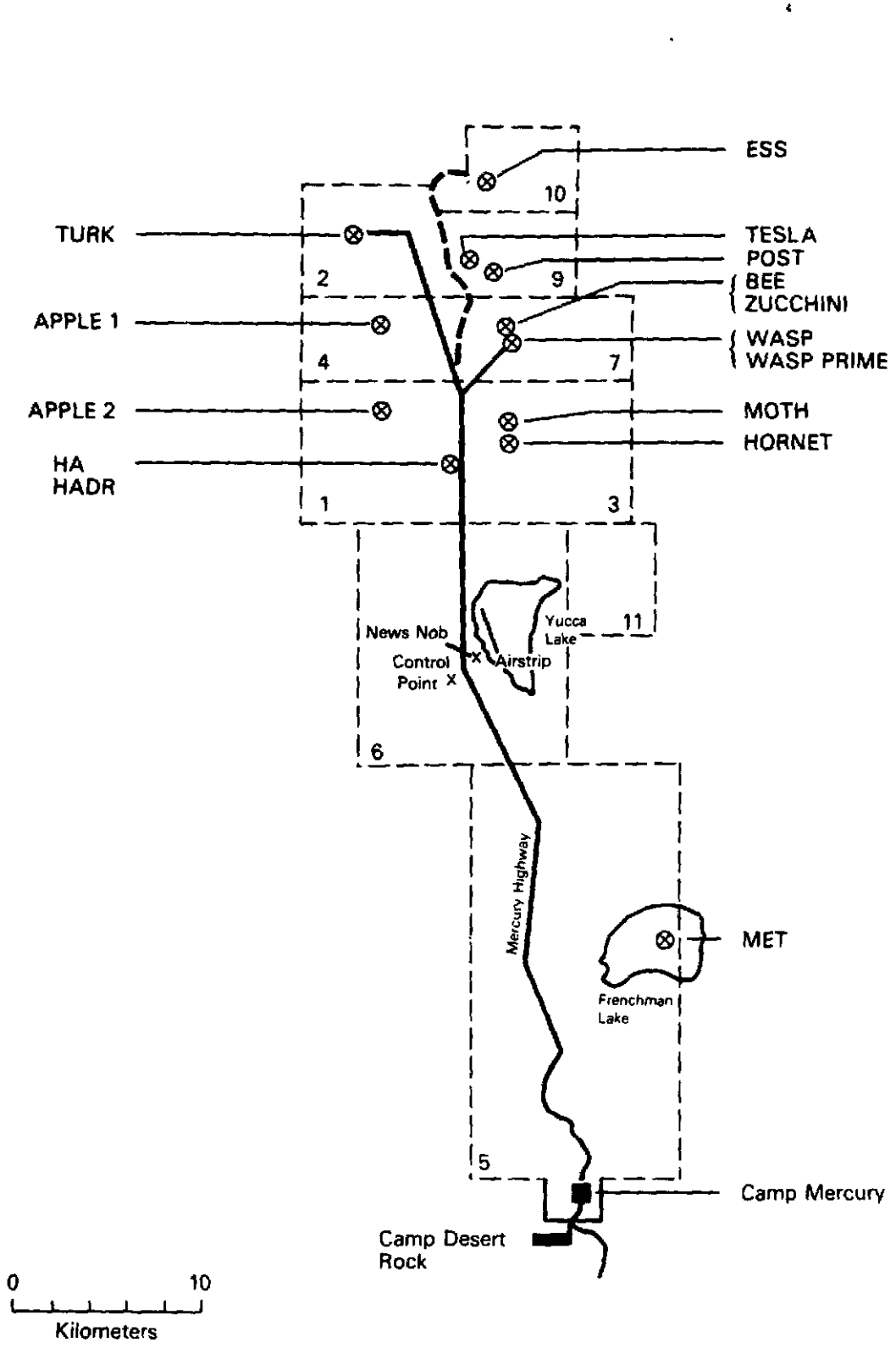
Film badge data are generally unavailable for Desert Rock VI participants. Therefore, most Army participants identified by name and film badge in the table were probably associated with JTO activites. However, some aggregate exposure data for Desert Rock VI participants is available in the Final Report of Operations, Desert Rock VI. It states that, for Desert Rock personnel:

- 97 individuals received over 3.0 but less than 6.0 roentgens of exposure
- 15 individuals received between 6.0 and 20.0 roentgens of exposure
- Two individuals received over 20.0 roentgens of exposure.

SUMMARY OF OPERATION TEAPOT EVENTS (1955)

Shot	WASP	MOTH	TESLA	TURK	HORNET	BEE	ESS	HADR	APPLE 1	WASP PRIME	HA	POST	MET	APPLE 2	ZUCCHINI
Sponsor	LASL	LASL	UCRL	UCRL	LASL	LASL	DOD	DOD	LASL	LASL	DOD	UCRL	LASL/ DOD	LASL	LASL
Planned Date	18 Feb	22 Feb	25 Feb	15 Feb	8 March	18 March	15 March	1 March	18 March	20 March	4 March	1 March	1 March	26 April	1 April
Actual Date	18 Feb	22 Feb	1 March	7 March	12 March	22 March	23 March	25 March	29 March	29 March	6 April	9 April	15 April	5 May	15 May
Local Time	1200	0545	0530	0520	0520	0505	1230	0900	0455	1000	1000	0430	1115	0510	0500
NTS Location	Area 7	Area 3	Area 9	Area 2	Area 3	Area 7	Area 10	Above Area 1	Area 4	Area 7	Above Area 1	Area 9	Area 5	Area 1	Area 7
Type of Detonation	Airdrop	Tower	Tower	Tower	Tower	Tower	Shaft	Airdrop	Tower	Airdrop	Airdrop	Tower	Tower	Tower	Tower
Height of Burst (Feet)	762	300	300	500	300	500	−67	38,000*	500	737	36,620*	300	400	500	500
Actual Yield (kt.)	1	2	7	43	4	8	1	(non-nuclear)	14	3	3	2	22	29	28

* Mean sea level



NEVADA TEST SITE SHOWING LOCATIONS OF SHOT GROUND ZEROS IN TEAPOT SERIES

SUMMARY OF DOSIMETRY FOR OPERATION TEAPOT AS OF NOVEMBER 1981

Service	Personnel Identified By Name	Personnel Identified By Name and By Film Badge	Gamma Exposure (Roentgens)					Number of Personnel with Zero Gamma Exposure*	Average Gamma Exposure (Roentgens)	Maximum Gamma Exposure (Roentgens)
			< .1	.1-1.0	1.0-3.0	3.0-5.0	5.0+			
Army	2,144	761	400	121	126	96	18	352	1.083	19.3
Navy	407	160	61	48	31	16	4	11	1.121	12.4
Air Force	603	603	290	154	97	53	9	1	.879	21.8
Marine Corps	2,305	510	117	391	2	0	0	67	.317	1.2
Scientific Personnel, Contractors, and Affiliates	123	122	74	28	18	2	0	27	.437	4.1
Service Unknown**	2,348	2,348	1,449	681	196	22	0	873	.282	3.8
TOTAL	7,930	4,504	2,391	1,423	470	189	31	1,331	.535	

* The number of personnel in this column is also represented in the < .1 Gamma Exposure column.
** Film badge data are available, but service affiliation is not.

PREFACE

Between 1945 and 1962, the United States Government, through the Manhattan Engineer District and its successor agency, the Atomic Energy Commission (AEC), conducted 235 atmospheric nuclear weapons tests at sites in the southwestern U.S. and in the Pacific and Atlantic Oceans. In all, an estimated 220,000 Department of Defense (DOD) participants, both military and civilian, were present at the tests. Approximately 90,000 of these participants were present at the nuclear weapons tests conducted at the Nevada Test Site (NTS),* northwest of Las Vegas, Nevada.

In 1977, 15 years after the last above-ground nuclear weapons test, the Center for Disease Control+ noted a possible leukemia cluster among a small group of soldiers present at Shot SMOKY, one weapons related test of Operation PLUMBBOB, the series of nuclear weapons tests conducted in 1957. Since that initial report by the Center for Disease Control, the Veterans Administration has received a number of claims for medical benefits from former military personnel who believe their health may have been affected by their participation in the weapons tests.

In late 1977, the DOD began a study that provided data to both the Center for Disease Control and the Veterans Administration on possible exposures to ionizing radiation among its military and civilian personnel who participated in the

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*The Nevada Proving Ground was renamed the Nevada Test Site during the TEAPOT Series.

+The Center for Disease Control is part of the U.S. Department of Health and Human Services (formerly the U.S. Department of Health, Education, and Welfare).

atmospheric nuclear weapons tests. The DOD organized an effort to:

- Identify DOD personnel who had taken part in the atmospheric nuclear weapons tests
- Determine the extent of the participants' exposure to ionizing radiation
- Provide public disclosure of information concerning participation by DOD personnel in the atmospheric nuclear weapons tests.

This report on Operation TEAPOT is based on the historical and technical documents associated with each of the atmospheric nuclear weapons tests conducted during the Series. The reports provide a public record of the activities and possible radiation exposure for use in ongoing public health research and policy analysis.

METHODS AND SOURCES USED TO PREPARE THIS VOLUME

The Defense Nuclear Agency compiled information for this volume by examining available documents that record the military operations and scientific activities performed during Operation TEAPOT, the series of nuclear weapons tests conducted in 1955. These records, most of which were developed by individuals and organizations participating in the TEAPOT Series, are kept in over three dozen document repositories throughout the United States.

In compiling information for this report, teams of historians, health physicists, radiation specialists, and information analysts canvassed document repositories known to contain materials on the nuclear weapons tests conducted in the southwestern U.S. These repositories include armed services libraries, Government agency archives and libraries, Federal repositories, and libraries of scientific and technical laboratories. The teams examined classified and unclassified documents

containing information on DOD participation in Operation TEAPOT. Researchers recorded relevant information concerning the activities of DOD personnel during TEAPOT, and catalogued the data sources.

Gathering data for this study presented a variety of challenges. Many different military and civilian organizations were involved in developing and storing records related to Operation TEAPOT. Each branch of the armed services and each civilian organization had its own system of recording information. Much material was not preserved, because it was not considered important at the time. In addition, some records have been lost or destroyed over the years. Other records have been transferred from one repository to another, and accounts of the transfer of documents are not always available.

An important example of such discrepancies is the documentation dealing with air operations at Operation TEAPOT. Several postshot and post-series documents were analyzed to determine the nature and extent of these air activities, including Parsons' Operational Summary (WT-1158) and Fackler's Technical Air Operations (WT-1206). The Operational Summary provides an overview of all activities conducted during the testing, primarily those of AFSWP. Technical Air Operations, however, is a more specific document, chronicling in detail the air operations of DOD personnel. Discrepancies as to numbers of aircraft actually participating in any single event exist between these two documents and other TEAPOT documents. When possible, these discrepancies were resolved through additional research. In those cases for which further research failed to resolve the problem, the Technical Air Operations report, WT-1206, was used because it deals specifically with air operations at TEAPOT and therefore is considered the more reliable document for determining the extent and nature of air operations.

Commonly, the surviving historical documentation of activities conducted during Operation TEAPOT addresses test specifications and technical information, rather than personnel data. Moreover, instances have arisen in which available historical documentation has revealed inconsistencies in vital factual data, such as the number of DOD participants in a certain project at a given shot or their locations and assignments at a given time. These inconsistencies in data usually occur between two or more documents, but occasionally appear within the same document. Efforts have been made to resolve these data inconsistencies wherever possible, or to otherwise bring them to the attention of the reader.

For several of the Desert Rock VI and Joint Test Organization (JTO) projects discussed in the TEAPOT volumes, the only available documents describing personnel activities are the Sixth Army's Desert Rock VI Operations Orders and the Test Director's schedule of events from "Operation Order 1-55." These sources detail the plans developed by DOD and AEC personnel prior to the TEAPOT Series; they do not necessarily describe the projects as conducted at the NTS. After-action documents, such as the Final Report of Operations for Exercise Desert Rock VI and the Weapons Tests Reports for the Armed Forces Special Weapons Project (AFSWP), summarize the projects performed during the TEAPOT Series, but do not always supply shot-specific information about personnel-related activities. Therefore, it is not known if all of the projects addressed in the planning documents and discussed in the volume were conducted exactly as planned.

ORGANIZATION OF TEAPOT REPORTS

This volume details participation by DOD personnel in Operation TEAPOT, the fifth nuclear weapons testing series conducted at the NTS. Four other publications address DOD activities during the TEAPOT Series:

- Shot Volume: Shots WASP through HORNET, the Early TEAPOT Tests

- Shot Volume: Shot BEE
- Shot Volume : Shot APPLE 2
- Shot Volume: Shots ESS through MET and Shot ZUCCHINI, the Final TEAPOT Tests

The volumes addressing the test events of Operation TEAPOT have been designed for use with one another. The Series volume contains information that applies to those dimensions of Operation TEAPOT that transcend specific events, such as historical background, organizational relationships, and radiological safety procedures. In addition, this volume contains a bibliography of all works consulted in the preparation of all five Operation TEAPOT reports. The two single-shot volumes describe DOD participation in Shots BEE and APPLE 2, respectively. These two events have been bound separately because they included significant Exercise Desert Rock maneuvers involving large numbers of DOD people. Each multi-shot volume combines shot-specific descriptions for several nuclear events. The shot and multi-shot volumes contain bibliographies only of the sources referenced in each text. Descriptions of activities concerning any particular shot in the TEAPOT Series, whether the shot is addressed in a single-shot volume or in a multi-shot volume, should be supplemented by the general organizational and radiological safety information contained in this volume.

The information in these reports is supplemented by the Reference Manual: Background Materials for the CONUS Volumes. This document summarizes information on radiation physics, radiation health concepts, exposure criteria, and measurement techniques, as well as a list of acronyms and a glossary of terms used in the DOD reports addressing test events in the continental U.S.

This volume is divided into six chapters. Chapter 1 provides background information about Operation TEAPOT, including

an explanation of the historical context of the Series, a description of the NTS, a summary and comparison of the 15 events in the Series, and a summary of DOD participants.

Chapter 2 describes the two groups with major DOD participation at Operation TEAPOT, the Joint Test Organization (JTO) and Exercise Desert Rock VI. This chapter defines the responsibilities of each group and its components in planning, administering, and supporting the tests of the nuclear device and in conducting other activities in conjunction with those tests.

Chapter 3 describes the Exercise Desert Rock VI military activities conducted during Operation TEAPOT, while chapter 4 describes various training activities, military effects and diagnostic experiments, and support missions conducted by DOD personnel. These chapters define objectives of the activities, describe the planned and actual procedures, and indicate at which shots the programs occurred.

Chapter 5 describes the radiological safety criteria and procedures in effect during Operation TEAPOT.

Chapter 6 is a study of the results of the radiation protection program during Operation TEAPOT, including an analysis of film badge readings for DOD personnel.